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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/735,079	12/11/2003	Richard B. Kaner	D501.	1268

7590 12/15/2005

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EXAMINER	
HU, HENRY S	

ART UNIT	PAPER NUMBER
1713	

DATE MAILED: 12/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/735,079	KANER ET AL.	
	Examiner	Art Unit	
	Henry S. Hu	1713	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☒ Claim(s) *2,3,5,13 and 15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. The examiner accepts the **drawing with eight figures** (six sheets) filed with this application on December 11, 2003. **Claims 1-18 are now pending with two independent claims (Claim 1 and Claim 14).** An action follows.

Specification

2. The disclosure is objected to because of the following informalities:

(a) On **Figure 1B,** it is obvious that **two carbon atoms carry the improper five bonds**. Re-drawing the chemical structure is required.

(b) On **page 15** at line 20 and may be throughout the specification, recitations such as "H_2S0_4", "$HN0_3$" and "$HCl0_4$" are improper. A correction to replace "0" with "**O**" for oxygen atoms is needed.

(c) On **page 16** at lines 5 and 7-8, recitation of "2,5 dialkoxyaniline" needs to be changed to "**2,5-dialkoxyaniline**", recitation of "poly2-alkoxyanilines" needs to be changed to "**poly(2-alkoxyaniline)**"; while recitation of "poly2,5 dialkoxyanilines" needs to be changed to "**poly(2,5-dialkoxyaniline)**".

Appropriate corrections for (a) - (c) are required.

Claim Objections

3. Claims 2-3, 5, 13 and 15 are objected to because of the following informalities:

(a) On **Claim 2** at lines 5 and 9-10, recitation of "2,5 dialkoxyaniline" needs to be changed to "**2,5-dialkoxyaniline**", while recitation of "2,5 dialkoxyaniline" needs to be changed to "**2,5-dialkoxyaniline**".

(b) On **Claim 3** at line 5, recitation of "ethylsurfonic acid" needs to be changed to "**ethanesulfonic acid**" to be consistent with other wording such as "methanesulfonic acid" used in the same claim.

(c) On **Claim 5** at line 4 and **Claim 15** at line 14, recitation of "diethylether" needs to be changed to "**diethyl ether**", while recitation of "dichloromethane" needs to be removed since it is exactly the same solvent as "methylene chloride" in the same claim.

(d) On **Claim 13** at lines 2 and 3, two typographical errors on "nanofib rs" and "l ss" for "**nanofibers**" and "**less**".

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. *The limitation of parent* ***Claim 1*** *in present invention relates to* ***a method of producing organic polymer nanofibers*** *having a reaction to chemical vapors, the method comprising:*

(a) ***forming a catalysis solution comprising an acid and an oxidizer,***

(b) ***forming a monomer solution comprising a monomer and an organic solvent,*** *and*

(c) ***disposing*** *the catalysis solution upon the monomer solution* ***for forming an aqueous and organic interfacial interface*** *between the catalysis solution upon the monomer solution for generating the organic polymer nanofibers.*

Other parent ***Claim 14*** *relates to the same method of Claim 1 but to prepare organic* ***conducting*** *polymer nanofibers. See other limitations of dependent* ***Claims 2-13 and 15-18.***

6. Claims 1-9 and 11-18 are rejected under 35 U.S.C. 102(e) as being anticipated by Noding et al. (US 5,792,830).

Regarding the limitations of two parent **Claims 1 and 14, Noding** et al. have disclosed a method to prepare **polyaniline** from oxidation of aniline monomer (which is a conducting polymer in the nature, see column 1, line 12-16), the preparation steps includes **contacting aniline monomers with (a) hydrogen peroxide, (b) at least one acid** from hydrogen chloride, hydrogen bromide or a mixture, **and (c) a catalytic amount of at least one metal-containing compound or complex**, under reaction conditions **sufficient to form polymerization** (abstract, line 1-8; column 1, line 43-56; column 3, line 9-18).

Although single phase is used for the polymerization, **interfacial polymerization process can be used to more effectively improve the yield of polyaniline as well as increasing its conductivity and molecular weight** (column 1, line 16-20; abstract, line 9-11; column 6, line 21-65). For instance, by using two immiscible phases including **water phase and organic solvent phase** so as to effectively provide the desired concentration (column 5, line 62 – column 6, line 6). The key point to use an **interfacial interface reaction** is that **un**protected aniline monomers are typically insoluble in water. By using interfacial interface, higher molecular weight linear polymer can then be isolated and processed into various forms including fiber as known in the art for conducting polymer (column 6, lines 40-41 and 62-65). Therefore, Noding anticipates the limitations of two parent Claims 1 and 14.

7. Regarding **Claim 4**, compound or its complex from ferrous chloride or ferric chloride (both are iron chlorides) may be used in catalytic amount. However, it can be in any amount

that will increase the rate of formation of the head-to-tail bonds between the aniline monomer in the mixture (column 5, line 34-61).

Regarding **Claim 5**, organic solvents in the purpose for interfacial interface would certainly include the claimed common organic solvents known in the art so as to become immiscible phase from water phase.

Regarding **Claims 6-9**, all the claimed limitations are the nature of polyaniline polymer. Solvent absorption can be applied to any material depending on the degree of absorption.

Regarding **Claims 11-13**, at least one acid from various types Lewis acids including hydrogen chloride, hydrogen bromide or others and maybe a mixture can be used in this regard (column 4, line 42 – column 5, line 33). The use of **polymeric acid dopants** may be desirable to improve the melt-processability or solution-processability (column 5, line 6-10).

Remaining dependent **Claims 2-3 and 15-18** are thereby rejected with the same reason from the above rejections of Claims 1, 4-9 and 11-14.

8. Claims 1-9 and 11-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Cheng (US 5,852,161) with the evidence of Noding et al. (US 5,792,830).

Regarding the limitations of two parent **Claims 1 and 14**, Cheng has disclosed an invention regarding the preparation of **low molecular weight polyaniline** by heating a para-haloaniline in the presence of **a high-boiling organic solvent** and a vanadium catalyst and then by removing hydrogen halide as it is produced (abstract, line 1-5). However, **Cheng** has also disclosed a known method (Synthetic Metals, vol. 36, pp. 139-182, (1990)) can be used to prepare regular **polyaniline** from oxidation of common aniline monomer (which is a conducting polymer in the nature, see column 1, line 12-23), the preparation steps involves the claimed interfacial interface reaction which includes **contacting aniline monomers with acidic aqueous or mixed aqueous and organic solvents by using chemical oxidants such as ammonium persulfate.**

As known in the prior art such as **US 5,792,830 to Noding** et al., single phase is commonly used for the polymerization. However, interfacial polymerization process can be used so as to more effectively improving several factors such as: increasing the yield of polyaniline, increasing its conductivity and molecular weight. The key point to use an **interfacial interface reaction** is that **un**protected aniline monomers are typically insoluble in water. By using interfacial interface, higher molecular weight linear polymer can then be isolated and processed into various forms including fiber as known in the art for conducting polymer. With respect to the required limitation of producing polymer in the form of nanofiber, Cheng has disclosed such obtained conducting polymers can be routinely in the form of film or **fiber** (column 1, line 11-14). Therefore, Cheng anticipates the limitations of two parent Claims 1 and 14.

9. Regarding **Claim 4**, ammonium persulfate and many other kind oxidants disclosed in the references therein may be used (column 1, line 18; also see references in columns 1-3 for oxidation of anilines).

Regarding **Claim 5**, organic solvents in the purpose for interfacial interface would certainly include the claimed common organic solvents known in the art so as to become immiscible phase from water phase.

Regarding **Claims 6-9**, all the claimed limitations are the nature of polyaniline polymer. Solvent absorption can be applied to any material depending on the degree of absorption.

Regarding **Claims 11-13**, at least one acid from various types Lewis acids including hydrogen chloride, hydrogen bromide or others and maybe a mixture can be used in this regard (see Noding on column 4, line 42 – column 5, line 33). The use of **polymeric acid dopants** may be desirable to improve the melt-processability or solution-processability (see Noding on column 5, line 6-10).

Remaining dependent **Claims 2-3 and 15-18** are thereby rejected with the same reason from the above rejections of Claims 1, 4-9 and 11-14.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Noding et al. (US 5,792,830) or Cheng (US 5,852,161), each individually in view of Stupp et al. (US 6,890,654 B2).

The discussion of the disclosures of the prior art of Noding and Cheng for Claims 1-9 and 11-18 of this office action is incorporated here by reference. With respect to Claim 10, each of Noding and Cheng is silent about **forming a pre-coating of the polymer nanofibers onto the gold terminals surface-modified with a thiol-containing layer**. **Stupp** teaches that in the

course of surface modification thiol functional group can be used to bind it to a gold substrate (column 11, line 41-44). By doing so, any amphiphilic molecule containing such a thiol group can be thereby first covalently coated onto the gold substrate, and then other material such as carbon nanotubes can be effectively binds as top coating.

In light of the fact that all the involving references are dealing with fiber or nano-scaled materials, one having ordinary skill in the art would therefore have found it obvious to apply a coating of Noding or Cheng's polyaniline fibrous material onto gold substrate by first surface-modification of gold substrate with amphiphilic molecule containing a thiol functional group as taught by Stupp. By doing so, an advantage can be obtained as such an amphiphilic molecule laying as a pre-coating in between will **enable the fibrous material to be effectively coated onto the gold substrate**. Therefore, it may produce a persistent, reliable and diversified polymeric nanocomposite product or device.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicants' disclosure. The following references relate to a method of producing organic and/or conducting polymer nanofibers through interfacial interface reaction:

US Patent No. 5,334,292 to Rajeshwar et al. only discloses the preparation of an electrochemically conductive polymer film comprising colloidal catalytic particles

homogeneously dispersed therein (abstract, line 1-3). **Polyaniline or polypyrrole can be prepared by electrochemical polymerization** of aniline in the presence of colloidal suspension of catalytic particles such as platinum (column 1, line 24-53). No interfacial interface polymerization process is disclosed.

13. Any inquiry concerning this communication or earlier communication from the examiner should be directed to **Dr. Henry S. Hu whose telephone number is (571) 272-1103**. The examiner can be reached on Monday through Friday from 9:00 AM –5:00 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu, can be reached on (571) 272-1114. The **fax** number for the organization where this application or proceeding is assigned is **(571) 273-8300** for all regular communications. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Henry S. Hu

Patent Examiner, art unit 1713, USPTO

December 9, 2005

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PRIMARY EXAMINER